Figure 10 is a schematic and flowchart illustration of operations related to processing a received signal using multi-pass demodulation according to other embodiments of the present invention; and

Figure 11 is a flowchart illustration of operations related to processing a received signal using multi-pass demodulation according to further embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

While the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the invention to the particular forms disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the claims. Like reference numbers signify like elements throughout the description of the figures.

The present invention may be embodied as methods and/or systems. Accordingly, the present invention may be embodied in hardware and/or in software (including firmware, resident software, micro-code, *etc.*). Furthermore, the present invention may take the form of a computer program product on a computer-usable or computer-readable storage medium having computer-usable or computer-readable program code embodied in the medium for use by or in connection with an instruction execution system. In the context of this document, a computer-usable or computer-readable medium may be any medium that can contain, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

The computer-usable or computer-readable medium may be, for example, but not limited to, an electronic, magnetic, optical, electromagnetic, infrared, or semiconductor system, apparatus, device, or propagation medium. More specific examples (a nonexhaustive list) of the computer-readable medium would include the following: an electrical connection having one or more wires, a portable computer diskette, a random access memory (RAM), a read-only memory (ROM), an erasable programmable read-only memory (EPROM or Flash memory), an optical fiber, and a portable compact disc read-only memory (CD-ROM). Note that the computer-usable

or computer-readable medium could even be paper or another suitable medium upon which the program is printed, as the program can be electronically captured, via, for instance, optical scanning of the paper or other medium, then compiled, interpreted, or otherwise processed in a suitable manner, if necessary, and then stored in a computer memory.

Referring now to **Figure 1**, an exemplary radiotelephone communication system, in accordance with embodiments of the present invention, includes a mobile terminal **22** and a base station transceiver **24**. The mobile terminal **22** includes a keyboard/keypad **26**, a display **28**, a speaker **32**, a microphone **34**, a transceiver **36**, and a memory **38** that communicate with a processor **42**. The transceiver **36** typically comprises a transmitter circuit **44** and a receiver circuit **46**, which respectively transmit outgoing radio frequency signals to the base station transceiver **24** and receive incoming radio frequency signals from the base station transceiver **24** via an antenna **48**. The radio frequency signals transmitted between the mobile terminal **22** and the base station transceiver **24** may comprise both traffic and control signals (*e.g.*, paging signals/messages for incoming calls), which are used to establish and maintain communication with another party or destination.

The foregoing components of the mobile terminal **22** may generally be included in many conventional mobile terminals and their functionality is generally known to those skilled in the art. It should be further understood, that, as used herein, the term "mobile terminal" may include a cellular radiotelephone with or without a multi-line display; a Personal Communications System (PCS) terminal that may combine a cellular radiotelephone with data processing, facsimile and data communications capabilities; a PDA that can include a radiotelephone, pager, Internet/intranet access, Web browser, organizer, calendar and/or a global positioning system (GPS) receiver; and a conventional laptop and/or palmtop receiver or other appliance that includes a radiotelephone transceiver. Mobile terminals may also be referred to as "pervasive computing" devices.

The base station transceiver **24** contains the radio transceivers supporting an individual cell in a cellular network and communicate with the mobile terminal **22** and other mobile terminals in the cell using a radio-link protocol. Although only one base station transceiver **24** is shown, it will be understood that many base station

transceivers may be connected through, for example, a mobile switching center and other devices to define a wireless communication network.

It will be understood that although the present invention may be embodied in communication apparatus, such as the mobile terminal **22** and/or the base station transceiver **24**, the present invention is not limited to such apparatus and/or systems. For example, the present invention may be embodied in such apparatus as data processing systems, modems, and application specific integrated circuits (ASICS). Indeed, the present invention may be embodied in any method, communication apparatus, and/or computer program product that utilizes selectively more than one type of demodulation for a received signal.

The signal received by the mobile terminal **22** may include not only a desired signal from the base station transceiver **24** but also noise and one or more interference signals. The desired signal may further include fields including known symbols. Note that a symbol may contain binary information and, therefore, may be embodied as a single bit. It should be understood, however, that a symbol may be used to embody information comprising multiple bits through various encoding and/or modulation techniques.

The selection of non-interferer cancellation (single user) or interferer cancellation (joint) demodulation in various embodiments of the present invention may be based on a variety of criteria. Either single-user (conventional) demodulation or two-user (joint) demodulation may be selected, for example, based on one or more of the following factors: 1) the presence or absence of a single, dominant interfering signal; 2) the level of dispersion in the desired signal's channel; 3) the speed of a mobile terminal as represented by a Doppler spread value of the desired signal; and 4) the existence of minimal or no signal interference. Selective adaptation of a radio receiver to perform either single-user demodulation or two-user (joint) demodulation based on the foregoing factors is discussed in detail in U. S. Patent Application No. 09/660,050, entitled "Apparatus for and Method of Adapting a Radio Receiver Using Control Functions," filed September 12, 2000, which is hereby incorporated herein by reference in its entirety.

Just as in the case where a deep fade can degrade performance when encountered while demodulating a user's slot, so can an abrupt change of interferer power affect a demodulation approach that estimates interferer quantities. As will be